

Emissions Calculations for Combustion

Andrew Deal - Air Quality Division

Mecklenburg County Land Use and Environmental Services Agency

MECKLENBURG COUNTY

AIR QUALITY

Combustion Sources

Typical Combustion Sources:

- Engines
- Boilers
- Process Heaters (i.e. Asphalt Drum Mixer)

Combustion Source Emissions Calculations

Typically you need:

- Hours of operation
- Fuel Usage (gallons, cubic feet, etc.)
- Fuel Type (natural gas, #2 fuel oil, etc.)
- Emission factors (i.e. AP-42, source tests)

Combustion Source Emissions Calculations

Let's get started

Example:

Source:	1500 kW (2000 hp) emergency generator	9 mmBtu/hr boiler
Run hours	55 hours of operation	6,800 hours of operation
Fuel usage And type	3,025 gallons combusted (#2 fuel oil)	60,000,000 cf of natural gas

Combustion Source Emissions Calculations

We have
spreadsheets:

The screenshot displays the Mecklenburg County Air Quality website. The top navigation bar includes links for GOVERNMENT, RESIDENTS, BUSINESSES, and VISITORS. The main content area is titled "Emission Calculation Spreadsheets" and provides instructions on how to use the spreadsheets for determining site emissions. It lists various emission sources and their corresponding spreadsheet files, along with their revision dates. A sidebar on the left contains links to Air Quality Home, Air Quality Commission, Community Information, Contact Us, e-Pay Air Quality Fees, Facility Database, Motor Vehicles, and Public Comment Opportunities. The footer of the page includes the Mecklenburg County Air Quality logo and contact information for Megan Green.

Mecklenburg County, NC > **Air Quality** > **Permitting Regulations** > **Emission Calculation Spreadsheets**

Air Quality

- > [Air Quality Home](#)
- > [Air Quality Commission](#)
- > [Community Information](#)
- > [Contact Us](#)
- > [e-Pay Air Quality Fees](#)
- > [Facility Database](#)
- > [Motor Vehicles](#)
- > [Public Comment Opportunities](#)

Address

Mailing Address:
Air Quality
2145 Suttie Avenue
Charlotte,
NC 28208

Office Location:
2145 Suttie Avenue
Charlotte,
NC 28208

[MAP](#)

Hours: Mon-Fri 8 a.m. - 5 p.m.

Contact

Megan Green
704-336-5430
[Send an Email](#)

Emission Calculation Spreadsheets

The following files are excel spreadsheets for use in determining site emissions. Click on the links below to download the Excel files to your computer. If you experience difficulties with these spreadsheets, please e-mail [Aaron Matijew](#).

Please submit the electronic version on disk as well as the paper version when making your emission calculation submittal to your MCAQ contact. If you would like to e-mail the electronic version directly to your MCAQ contact, please call them at 704-336-5430 to coordinate such action.

Need help reporting emissions or using our spreadsheets? [Refer to the MCAQ Emissions Workbook.](#)

Coal Combustion	Rev 02/2013
Concrete Batch Plants	Rev 09/2015
Crematory Incinerators	Rev 09/2009
Fuel Oil Combustion	Rev 07/2017
Dual Fuel and Large Diesel Engines	Rev 02/2016
Instruction Document (NEW)	
Gasoline and Small Diesel Engines	Rev 02/2016
Liquefied Petroleum Gas (LPG) Combustion	Rev 03/2017
Medical Waste Incineration	Rev 05/2010
Natural Gas Combustion	Rev 03/2017
Stone/Rock/Slag Quarry Operations	Rev 05/2011
Wood Combustion	Rev 03/2017
Wood Working Operations	Rev 07/2007
Hot Mix Asphalt	Rev 06/2016
Gasoline Terminals	Rev 05/2011
Stage I Gasoline Dispensing	Rev 05/2013
VOC and Air Toxics from Coatings	Rev 03/2015

These spreadsheets use emission factors from the latest version of [EPA's AP-42 Volume 1 for Stationary Sources](#). Emission test results may provide more accurate emission estimates and should be considered for use. It may be acceptable to use previous valid source specific test results, or testing that the process equipment's manufacturer performed during a similar operating scenario. If you have a question as to which is the more appropriate method to calculate emissions, please ask your MCAQ contact at 704-336-5430.

MECKLENBURG COUNTY

AIR QUALITY

Combustion Source Emissions Calculations

1500 kW
(2000 hp)
Generator:

Address

Mailing Address:

Air Quality
2145 Suttle Avenue
Charlotte,
NC 28208

Office Location:

2145 Suttle Avenue
Charlotte,
NC 28208

[MAP](#)

Hours: Mon-Fri 8 a.m - 5 p.m.

Contact

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VOC and Air Toxics from Coating	Rev 03/2015

These spreadsheets use emission factors from the latest version of [EPA's AP-42 Volume 1 for Stationary](#)

MECKLENBURG COUNTY

AIR QUALITY

Combustion Source Emissions Calculations

9 mmBtu
Boiler:

Address

Mailing Address:

Air Quality
2145 Suttle Avenue
Charlotte,
NC 28208

Office Location:

2145 Suttle Avenue
Charlotte,
NC 28208

[MAP](#)

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MECKLENBURG COUNTY

AIR QUALITY

Combustion Source Emissions Calculations

1500 kW Generator:

Large Diesel and All Dual-Fuel Engines Emissions Calculator Feb 26, 2016 Revision

Instructions: Please provide the information shown in **blue** below. The applicability of this spreadsheet is limited to diesel engines larger than 600 hp and all dual-fuel (diesel/natural gas) engines. Please note that, when used in conjunction with permit applications, any value entered for annual operations of these engines may become a permit limit.

For annual emissions enter either (1) **Engine Output (hp)** and **Annual Operation (hours)** or (2) **Generator Output (kW)** and **Annual Operation (hours)**.

User Input

Company Name:	Hot ICE Company	This section can be used to calculate kW-hr output from hours of operation and engine hp output. This can be useful for operators with hour meters but no Watt-hour meters. It assumes full load operation resulting in conservative emission estimates.	
Plant County:	Mecklenburg		
Plant City:	Charlotte		
Permit Number:	NA		
User:	V. Hot		
Diesel Fuel Sulfur Content (%):	0.5000	Annual Operation (hours):	500
NG Fuel Sulfur Content (gr/mm cu ft):	0	Generator Output (kW):	750
Engine Output (hp):	0	Annual Output (kW-hr):	375,000
Annual Electrical Output (kW-hr):	375,000		
Annual Output (hp-hr):	571,458		

DISCLAIMER: This spreadsheet is for your use only and should be used with caution. MCAQ does not guarantee the accuracy of the information contained. This spreadsheet is subject to continual revision and updating. It is your responsibility to be aware of the most current information available. MCAQ is not responsible for errors or omissions that may be contained herein.

Emissions Output for Diesel Engines

Criteria Pollutants					Emission Factor	Factor Quality
Pollutant		lb/hr	lb/yr	tpy	lb/hp-hr	Rating
PM		0.80	400.02	0.20	7.00E-04	B
PM-10		0.80	400.02	0.20	7.00E-04	B
PM-2.5		0.80	400.02	0.20	7.00E-04	B
NO _x , uncont.		27.43	13,715.00	6.86	2.40E-02	B
NO _x , cont.		14.86	7,428.96	3.71	1.30E-02	B
TOC (as CH ₄)		0.81	402.88	0.20	7.05E-04	C
NMTOC		0.73	366.62	0.18	6.42E-04	E
CO		6.29	3,143.02	1.57	5.50E-03	C
SO _x		4.62	2,311.55	1.16	4.05E-03	B
Total HAP		1.40E-02	7.01	0.004	1.23E-05	
Largest HAP (benzene)		6.21E-03	3.10	0.002	5.43E-06	

Emissions Output for Dual-fuel Engines

Criteria Pollutants				Emission Factor	Factor Quality
Pollutant	lb/hr	lb/yr	tpy	(lb/hp-hr)	Rating
PM	NA	NA	NA	ND	NA
PM-10	NA	NA	NA	ND	NA
PM-2.5	NA	NA	NA	ND	NA
NO _x , uncont.	20.57	10,286.25	5.14	1.80E-02	D
NO _x , cont.	NA	NA	NA	ND	NA
TOC (as CH ₄)	6.05	3,023.01	1.51	5.29E-03	D
NMTOC	1.51	754.32	0.38	1.32E-03	E
CO	8.57	4,285.94	2.14	7.50E-03	D
SO _x	0.23	116.01	0.06	2.03E-04	B

MECKLENBURG COUNTY

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Combustion Source Emissions Calculations

9 MMBtu/hr Boiler:

NATURAL GAS COMBUSTION EMISSIONS CALCULATOR REVISION 3/23/2017 - INPUT SCREEN

Instructions: Enter emission source / facility data on the "INPUT" tab/screen. The air emission results and summary of input data are viewed / printed on the "OUTPUT" tab/screen. The different tabs are on the bottom of this screen.

This spreadsheet is for your use only and should be used with caution. MCAQ does not guarantee the accuracy of the information contained. This spreadsheet is subject to continual revision and updating. It is your responsibility to be aware of the most current information available. MCAQ is not responsible for errors or omissions that may be contained herein.

Enter information highlighted in BLUE

General Facility Information

FACILITY NAME: Facility Name
PREMISE NUMBER: 0123
PERMIT NUMBER: 9999R02
FACILITY CITY: City
FACILITY COUNTY: Mecklenburg
SPREADSHEET PREPARED BY: Your Name

Emission Source Input Data

EMISSION SOURCE ID NO.: ES-1
MAXIMUM HEAT INPUT (MILLION BTU PER HOUR): 0.00 mmbtu/hr
TYPE OF BOILER: SMALL BOILER (<100 mmbtu/hr)
DOES THE SOURCE ALSO BURN COAL OR FUEL OIL? No
LATEST CONSTRUCTION/MODIFICATION DATE: 5/1/2000 (mm/dd/yyyy)

ADDITIONAL INFORMATION FOR GREENHOUSE GAS (GHG) EMISSIONS

ENTER Calculation Tier from EPA Mandatory Reporting Rule (MRR) Subpart C
* See <http://www.epa.gov/climatechange/emissions/ghgrulemaking.html> TIER 1: DEFAULT HHV AND DEFAULT EF
SINCE TIER 3 IS NOT BEING USED, DO NOT ENTER FUEL CARBON CONTENT 0.7500
SINCE TIER 3 IS NOT BEING USED, DO NOT ENTER MOLECULAR WEIGHT 19.00 kg/kg-mole

FUEL HEATING VALUE

ANNUAL AVG MEASURED FUEL HEATING VALUE (BTU/SCF): 1.020 BTU/SCF --> (USE DEFAULT UNLESS YOU HAVE ANOTHER VALUE FROM YOUR NATURAL GAS COMPANY)
EPA default fuel heating value (BTU/SCF), as listed below, will be used for GHG calculations under Tier 1 approach)
1.028 BTU/SCF default value is from EPA's mandatory reporting rule, Table C-1, "Natural Gas Pipeline (Weighted U.S. Average)"

USAGE AND OTHER SOURCE-SPECIFIC DATA

ACTUAL ANNUAL FUEL USAGE (MILLION SCF): 0.00 MILLION SCF
CALCULATED POTENTIAL YEARLY USAGE (MILLION SCF) 0.00 MILLION SCF
REQUESTED ANNUAL LIMITATION (MILLION SCF) 0.00 MILLION SCF (TYPE OVER IF NECESSARY - DEFAULT IS POTENTIAL)

DAILY HOURS OF OPERATION: 24 HOURS
TYPE OF EMISSION CONTROL: NO CONTROL
IS SNCR APPLIED TO THE BOILER? NO

This information is only required if you are, or will be permitted for GHGs.

Use Instructions tab to convert from Therms to SCF

Low NOx Burner is the most common control device on newer boilers

MECKLENBURG COUNTY

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Combustion Source Emissions Calculations

Print the output tabs and your done!

Almost

We need the reporting form

Combustion Source Emissions Calculations

Emissions Form:

Calendar Year 2018 Annual Emission Report

Facility Name: The Generator and Boiler Place *Current Permit Number:* 18-001-000

- A facility-wide annual emissions report is due for each Mecklenburg County facility that has a currently active permit with Mecklenburg County Air Quality. This report is due by April 30 for the previous calendar year.
- The report shall include all supporting documentation, including emission rate, product usage, operating hours, and all relevant information for emission calculations.
- Use the summary table on the following page to summarize emissions from each emission source or insignificant activity for which you are required to report. You may also create your own summary page for the annual emissions from your facility instead of using MCAQ's annual emission summary table.

What do I need to report?	Where do I find what <u>information</u> I need to report?
1. Emissions emanating from all emission sources listed in the facility's current air quality permit	In your facility's air permit, look at the last permit condition. It will contain the reporting requirements for all emission sources at your facility.
2. Emissions emanating from any insignificant activities that have reporting requirements	In Appendix B, look at the recordkeeping/reporting column in the insignificant activities table. If there are reporting requirements for any insignificant activities at your facility, they will be specified here.

The undersigned certifies that all information and statements provided on this annual emission report, based on information and belief formed after reasonable inquiry, are true, accurate, and complete.

Signature of Responsible Company Representative	Printed Name	Date
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Return the completed form to:
Mecklenburg County Air Quality
2145 Suttle Avenue
Charlotte, NC 28208-5237
(704) 336-5430
Fax (704) 336-4391

MCAQ Annual Emission Reporting Form

Pg. 1
Rev. 12/15

Combustion Source Emissions Calculations

The summary (I recommend excel):

Example Summary			
CY 2018	Generator:	Boiler:	Total:
	(fuel use)	tpy	tpy
Pollutant	tpy		
PM	0.0424	0.0201	0.0624
PM-10	0.0424	0.0201	0.0624
PM-2.5	0.0424	0.0166	0.0590
NO _x uncont.	1.3552	3.0000	4.3552
NO _x cont.	0.8047	3.0000	3.8047
TOC (as CH ₄)	0.0381	0.1650	0.2031
NMTOC	0.0347	0.1650	0.1997
CO	0.3600	0.3600	0.7200
SO _x	0.2139	0.0180	0.2319
Total HAP	0.0007	0.0565	0.0572
Benzene	0.0003	0.0001	0.0004
Hexane	-	0.0540	0.0540

Questions?

Andrew.Deal@MecklenburgCountyNC.gov

980-314-3352

MECKLENBURG COUNTY

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